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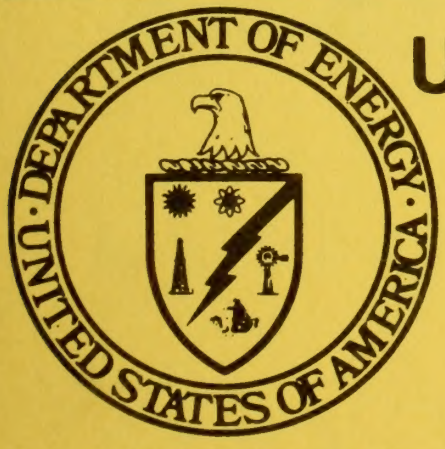
SOLAR/1012-79/04

Monthly Performance Report

J. D. EVANS

HOUSE A

APRIL 1979



U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

J. D. EVANS, INC.
HOUSE A

APRIL 1979

I. SYSTEM DESCRIPTION

J. D. Evans, Inc., House A is one of two instrumented single-family residences in Columbia, Maryland. The home has approximately 2250 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 350 square feet. The array faces south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in the basement in a 1000-gallon steel storage tank. Incoming city water is preheated in a liquid-to-liquid heat exchanger located in the storage tank and then flows into a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat exchanger within a heat pump and an electrical heating element in the air-distribution duct provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the temperature difference between the storage tank and the collector outlet is higher than 15°F. Water circulates from the storage tank through the collector until a temperature difference of less than 5°F is reached.

Mode 2 - Storage-to-Space Heating: This mode activates when thermal energy for space heating is requested by the room thermostat. Solar-heated water from storage circulates through a liquid-to-air heat exchanger in the space heating air duct. If solar energy is insufficient to satisfy the space heating load, the heat pump and/or the auxiliary electrical heating element will be activated. The electrical strip heater can also be manually operated without solar heating and heat pump operation.

Mode 3 - DHW Preheating: This mode is activated by drawing hot water from the system. Cold supply water is preheated in a liquid-to-liquid heat exchanger located in the solar energy storage tank before flowing to the DHW tank. If the required DHW tank temperature is not maintained by solar preheating, auxiliary energy is provided by the electrical heating element in the DHW tank.

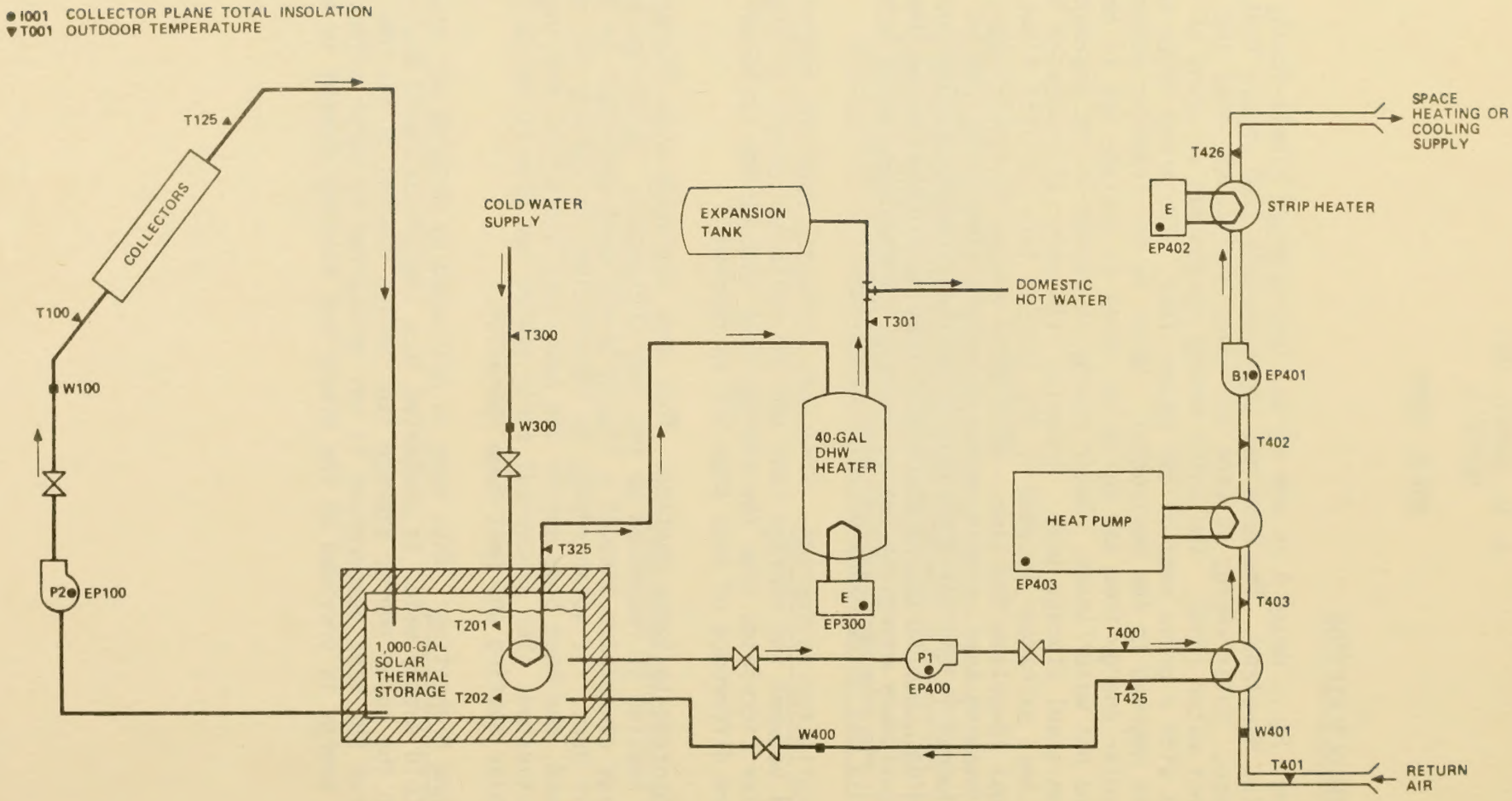

Figure 1. J. D. EVANS, INC., HOUSE A SOLAR ENERGY SYSTEM SCHEMATIC

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in April and the solar energy system operated continuously during the month. Solar energy satisfied 51 percent of the DHW requirements and 58 percent of the space heating requirements. The solar energy system provided electrical energy savings of 0.68 million Btu.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 12.9 million Btu for a daily average of 1228 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during April of 1467 Btu per square foot for a south-facing plane with a tilt of 45 degrees to the horizontal. The average ambient temperature during April was 51°F as compared with the long-term average for April of 54°F. The number of heating degree-days for the month (based on a 65°F reference) was 412, as compared with the long-term average of 340.

THERMAL PERFORMANCE

System - During April the solar energy system performed approximately the same as expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as inputs. Solar energy collected was 2.8 million Btu versus an estimated 2.3 million Btu. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 1.5 million Btu. System total solar fraction was 56 percent versus an estimated 58 percent.

Collector - The total incident solar radiation on the collector array for the month of April was 12.9 million Btu. During the period the collector loop was operating, the total insolation amounted to 9.1 million Btu. The total collected solar energy for the month of April was 2.8 million Btu, resulting in a collector array efficiency of 22 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 2.8 million Btu. Operating energy required by the collector loop was 0.15 million Btu.

Storage - Solar energy delivered to storage was 2.8 million Btu. There were 1.5 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 1.3 million Btu. This loss represented 46 percent of the energy delivered to storage. The storage efficiency was 54 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 124°F.

DHW Load - The DHW subsystem consumed 0.38 million Btu of solar energy and 0.43 million Btu of auxiliary electrical energy to satisfy a hot water load of 0.65 million Btu. The solar fraction of this load was 51 percent. Losses

from the DHW subsystem were 0.16 million Btu. The DHW subsystem consumed no operating energy, resulting in an electrical energy savings of 0.38 million Btu. A daily average of 29 gallons of DHW was consumed at an average temperature of 140°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 1.1 million Btu of solar energy and 0.34 million Btu of auxiliary electrical energy to satisfy a space heating load of 1.8 million Btu. The heat pump supplied a load of 0.78 million Btu. The solar fraction of the space heating load was 58 percent. The space heating subsystem consumed a total of 0.17 million Btu of operating energy, resulting in an electrical energy savings of 0.45 million Btu. The average ambient temperature inside the house was 69°F.

OBSERVATIONS

The flow sensor in the collector loop was not functioning. A historical average value of the fluid flow was used in the calculation of collected solar energy. The electrical energy savings for the space heating subsystem were determined based on conventional heating using a heat pump.

ENERGY SAVINGS

The solar energy system provided a net electrical energy savings of 0.68 million Btu. The DHW subsystem provided an electrical energy savings of 0.38 million Btu, while the space heating subsystem contributed an electrical energy savings of 0.45 million Btu.

III. ACTION STATUS

Boeing/IBM is expected to investigate the collector loop flow sensor.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

SITE/SYSTEM DESCRIPTION:
THE INSTALLATION CONSISTS OF TWO ADJACENT BUT SEPARATE RESIDENCES USING A SINGLE J-BOX AND SDAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	12.895	MILLION BTU
	36842	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	2.818	MILLION BTU
	8051	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	51	DEGREES F
AVERAGE BUILDING TEMPERATURE	69	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.11	
ECSS OPERATING ENERGY	0.154	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.323	MILLION BTU
TOTAL ENERGY CONSUMED	3.761	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	0.646	1.847	N.A.	2.493	MILLION BTU
SOLAR FRACTION	51	58	N.A.	*	PERCENT
SOLAR ENERGY USED	0.384	1.068	N.A.	1.451	MILLION BTU
OPERATING ENERGY	N.A.	0.173	N.A.	0.323	MILLION BTU
AUX. THERMAL ENERGY	0.427	0.237	N.A.	0.664	MILLION BTU
AUX. ELECTRIC FUEL	0.427	0.339	N.A.	0.766	MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
ELECTRICAL SAVINGS	0.384	0.451	N.A.	0.681	MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.687

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

SITE/SYSTEM DESCRIPTION:
THE INSTALLATION CONSISTS OF TWO ADJACENT BUT SEPARATE RESIDENCES USING A SINGLE J-BOX AND SDAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	13.604 GIGA JOULES
	418382 KJ/SQ.M.
COLLECTED SOLAR ENERGY	2.973 GIGA JOULES
	91428 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	11 DEGREES C
AVERAGE BUILDING TEMPERATURE	20 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.11
ECSS OPERATING ENERGY	0.163 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.341 GIGA JOULES
TOTAL ENERGY CONSUMED	3.968 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.682	1.949	N.A.	2.631 GIGA JOULES
SOLAR FRACTION	51	58	N.A.	* PERCENT
SOLAR ENERGY USED	0.405	1.127	N.A.	1.531 GIGA JOULES
OPERATING ENERGY	N.A.	0.183	N.A.	0.341 GIGA JOULES
AUX. THERMAL ENG	0.451	0.250	N.A.	0.701 GIGA JOULES
AUX. ELECTRIC FUEL	0.451	0.357	N.A.	0.808 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	0.405	0.476	N.A.	0.718 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.687

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND SCLAP/1012-79/04
REPORT PERIOD: APRIL, 1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.188	58	N	N	0.002	N	0.066
2	0.066	49	O	O	0.000	O	1.076
3	0.109	48	T	T	0.000	T	0.694
4	0.033	41			0.000		1.632
5	0.512	47	A	A	0.011	A	0.085
6	0.865	42	P	P	0.011	P	0.153
7	0.817	37	P	P	0.011	P	0.191
8	0.254	41	L	L	0.003	L	0.486
9	0.046	40	I	I	0.000	I	0.536
10	0.816	45	C	C	0.011	C	0.008
11	0.728	51	A	A	0.010	A	0.001
12	0.152	52	B	B	0.000	B	0.002
13	0.093	46	L	L	0.000	L	0.009
14	0.682	48	E	E	0.008	E	0.000
15	0.301	50			0.000		0.001
16	0.180	46			0.000		0.621
17	0.420	49			0.007		0.192
18	0.780	52			0.010		0.091
19	0.801	52			0.010		0.102
20	0.732	53			0.009		0.100
21	0.739	57			0.009		0.065
22	0.485	61			0.006		0.055
23	0.305	64			0.000		0.143
24	0.155	61			0.000		0.111
25	0.472	66			0.008		0.040
26	0.132	61			0.000		0.166
27	0.276	59			0.003		0.051
28	0.411	55			0.007		0.057
29	0.645	51			0.009		0.082
30	0.699	57			0.009		0.092
SUM	12.895	-	N.A.	N.A.	0.154	N.A.	-
AVG	0.430	51	N.A.	N.A.	0.005	N.A.	0.113
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.188	0.074	0.021	62	0.113
2	0.066	0.000	0.000	50	0.000
3	0.109	0.000	0.000	50	0.000
4	0.033	0.000	0.000	41	0.000
5	0.512	0.456	0.146	55	0.286
6	0.865	0.794	0.267	44	0.308
7	0.817	0.733	0.251	43	0.308
8	0.254	0.122	0.037	46	0.147
9	0.046	0.000	0.000	43	0.000
10	0.816	0.759	0.279	51	0.342
11	0.728	0.626	0.201	61	0.276
12	0.152	0.000	0.000	56	0.000
13	0.093	0.000	0.000	46	0.000
14	0.682	0.521	0.144	55	0.211
15	0.301	0.000	0.000	54	0.000
16	0.180	0.000	0.000	50	0.000
17	0.420	0.265	0.067	52	0.160
18	0.780	0.685	0.237	59	0.303
19	0.801	0.689	0.217	60	0.271
20	0.732	0.609	0.187	61	0.255
21	0.739	0.596	0.166	69	0.224
22	0.485	0.258	0.074	70	0.153
23	0.305	0.000	0.000	70	0.000
24	0.155	0.000	0.000	68	0.000
25	0.472	0.344	0.079	74	0.168
26	0.132	0.000	0.000	63	0.000
27	0.276	0.135	0.032	62	0.116
28	0.411	0.302	0.092	66	0.224
29	0.645	0.502	0.147	58	0.228
30	0.699	0.584	0.173	67	0.248
SUM	12.895	9.055	2.818	-	-
AVG	0.430	0.302	0.094	57	0.219
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
Ø DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.021	0.012	-0.018	130	-0.254
2	0.000	0.071	-0.098	123	1.000
3	0.000	0.076	-0.152	105	1.000
4	0.000	0.054	-0.103	88	1.000
5	0.146	0.043	0.077	92	0.824
6	0.267	0.132	0.065	100	0.740
7	0.251	0.156	0.048	104	0.810
8	0.037	0.123	-0.150	97	-0.712
9	0.000	0.025	-0.062	83	1.000
10	0.279	0.007	0.278	99	1.020
11	0.201	0.000	0.166	130	0.829
12	0.000	0.000	-0.030	141	1.000
13	0.000	0.001	-0.040	135	1.000
14	0.144	0.000	0.070	136	0.485
15	0.000	0.000	-0.027	141	1.000
16	0.000	0.112	-0.195	130	1.000
17	0.067	0.081	-0.031	106	0.734
18	0.237	0.071	0.145	115	0.915
19	0.217	0.082	0.110	132	0.886
20	0.187	0.073	0.054	144	0.682
21	0.166	0.048	0.049	154	0.581
22	0.074	0.027	-0.024	156	0.030
23	0.000	0.043	-0.086	149	1.000
24	0.000	0.017	-0.044	139	1.000
25	0.079	0.019	0.002	136	0.264
26	0.000	0.022	-0.046	134	1.000
27	0.032	0.014	-0.037	127	-0.716
28	0.092	0.024	0.028	127	0.563
29	0.147	0.053	0.062	132	0.782
30	0.173	0.064	0.071	141	0.780
SUM	2.818	1.451	0.079	-	-
AVG	0.094	0.048	0.003	124	0.543
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND
REPORT PERIOD: APRIL,1979

SOLAR/1012-79/04

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.019	37	0.012	N	0.012	0.012	N	0.012	N	67	140	24
2	0.007	39	0.004	O	0.008	0.008	O	0.004	O	62	140	9
3	0.011	34	0.005	T	0.014	0.014	T	0.005	T	53	139	15
4	0.006	27	0.002		0.010	0.010		0.002		58	140	9
5	0.001	20	0.000	A	0.007	0.007	A	0.000	A	64	139	1
6	0.000	15	0.000	P	0.010	0.010	P	0.000	P	57	139	0
7	0.022	23	0.010	P	0.016	0.016	P	0.010	P	57	142	27
8	0.012	29	0.004	L	0.014	0.014	L	0.004	L	58	143	15
9	0.041	21	0.008	I	0.039	0.039	I	0.006	I	51	142	53
10	0.038	19	0.007	C	0.035	0.035	C	0.007	C	54	142	48
11	0.001	15	0.000	A	0.006	0.006	A	0.000	A	63	141	1
12	0.000	14	0.000	B	0.005	0.005	B	0.000	B	64	140	1
13	0.001	12	0.001	L	0.005	0.005	L	0.001	L	64	139	2
14	0.000	12	0.000	E	0.007	0.007	E	0.000	E	61	139	1
15	0.000	10	0.000		0.006	0.006		0.000		62	139	1
16	0.021	29	0.009		0.018	0.018		0.009		62	139	28
17	0.028	34	0.011		0.019	0.019		0.011		55	141	37
18	0.044	44	0.023		0.028	0.028		0.023		56	141	56
19	0.022	50	0.015		0.013	0.013		0.015		56	143	29
20	0.037	66	0.030		0.012	0.012		0.030		58	140	50
21	0.035	73	0.030		0.011	0.011		0.030		58	141	46
22	0.026	78	0.024		0.006	0.006		0.024		61	139	35
23	0.053	78	0.043		0.014	0.014		0.043		61	139	71
24	0.025	58	0.017		0.012	0.012		0.017		60	141	35
25	0.030	60	0.019		0.015	0.015		0.019		59	139	41
26	0.033	58	0.022		0.017	0.017		0.022		61	140	45
27	0.025	53	0.014		0.013	0.013		0.014		60	141	34
28	0.025	49	0.015		0.020	0.020		0.015		59	142	34
29	0.050	62	0.031		0.022	0.022		0.031		61	141	67
30	0.034	55	0.026		0.013	0.013		0.026		61	141	45
SUM	0.646	-	0.384	N.A.	0.427	0.427	N.A.	0.384	N.A.	-	-	860
AVG	0.022	51	0.013	N.A.	0.014	0.014	N.A.	0.013	N.A.	59	140	29
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND SCLAR/1012-79/04
REPORT PERIOD: APRIL, 1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR. OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	0.000	0.000	N	0.000	N	73	58
2	0.066	100	0.066	0.005	0.000	0.000	O	0.026	O	69	49
3	0.071	100	0.071	0.010	0.000	0.000	T	0.028	T	69	48
4	0.247	21	0.053	0.021	0.058	0.083		0.021		69	41
5	0.174	25	0.043	0.012	0.039	0.056	A	0.017	A	68	47
6	0.132	100	0.132	0.022	0.000	0.000	F	0.055	F	69	42
7	0.146	100	0.146	0.021	0.000	0.000	P	0.072	P	69	37
8	0.119	100	0.119	0.021	0.000	0.000	L	0.053	L	69	41
9	0.303	6	0.018	0.019	0.087	0.124	I	0.007	I	69	40
10	0.170	0	0.000	0.008	0.052	0.075	C	0.000	C	66	45
11	0.000	0	0.000	0.000	0.000	0.000	A	0.000	A	63	51
12	0.000	0	0.000	0.000	0.000	0.000	B	0.000	B	64	52
13	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	62	46
14	0.000	0	0.000	0.000	0.000	0.000	E	0.000	E	60	48
15	0.000	0	0.000	0.000	0.000	0.000		0.000		62	50
16	0.103	100	0.103	0.006	0.000	0.000		0.041		63	46
17	0.069	100	0.069	0.010	0.000	0.000		0.028		68	49
18	0.048	100	0.048	0.006	0.000	0.000		0.019		68	52
19	0.067	100	0.067	0.005	0.000	0.000		0.028		68	52
20	0.043	100	0.043	0.003	0.000	0.000		0.018		69	53
21	0.017	100	0.017	0.001	0.000	0.000		0.007		70	57
22	0.003	100	0.003	0.000	0.000	0.000		0.001		72	61
23	0.000	0	0.000	0.000	0.000	0.000		0.000		74	64
24	0.000	0	0.000	0.000	0.000	0.000		0.000		73	61
25	0.000	0	0.000	0.000	0.000	0.000		0.000		73	66
26	0.000	0	0.000	0.000	0.000	0.000		0.000		73	61
27	0.000	0	0.000	0.000	0.000	0.000		0.000		72	59
28	0.009	100	0.009	0.001	0.000	0.000		0.003		71	55
29	0.022	100	0.022	0.001	0.000	0.000		0.009		70	51
30	0.038	100	0.038	0.002	0.000	0.000		0.017		70	57
SUM	1.847	-	1.068	0.173	0.237	0.339	N.A.	0.451	N.A.	-	-
AVG	0.062	58	0.036	0.006	0.008	0.011	N.A.	0.015	N.A.	69	51
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	536	N	58	62	N	N	N
2	187	O	49	50	O	O	O
3	312	T	48	50	T	T	T
4	95		41	41			
5	1462	A	47	55	A	A	A
6	2471	P	42	44	P	P	P
7	2335	P	37	43	P	P	P
8	725	L	41	46	L	L	L
9	133	I	40	43	I	I	I
10	2330	C	45	51	C	C	C
11	2079	A	51	61	A	A	A
12	435	B	52	56	B	B	B
13	267	L	46	46	L	L	L
14	1947	E	48	55	E	E	E
15	861		50	54			
16	513		46	50			
17	1201		49	52			
18	2228		52	59			
19	2288		52	60			
20	2093		53	61			
21	2113		57	69			
22	1387		61	70			
23	870		64	70			
24	444		61	68			
25	1350		66	74			
26	377		61	63			
27	789		59	62			
28	1175		55	66			
29	1842		51	58			
30	1998		57	67			
SUM	36842	N.A.	-	-	-	-	-
AVG	1228	N.A.	51	57	N.A.	N.A.	N.A.
NBS ID	0001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: J.D. EVANS,INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-79/04
REPORT PERIOD: APRIL,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.000	0.000	N	N	0.000
2	0.000	0.000	O	O	0.000
3	0.000	0.000	T	T	0.000
4	0.194	0.083			0.000
5	0.131	0.056	A	A	0.000
6	0.000	0.000	P	P	0.000
7	0.000	0.000	P	P	0.000
8	0.000	0.000	L	L	0.000
9	0.285	0.124	I	I	0.000
10	0.170	0.075	C	C	0.000
11	0.000	0.000	A	A	0.000
12	0.000	0.000	B	B	0.000
13	0.000	0.000	L	L	0.000
14	0.000	0.000	E	E	0.000
15	0.000	0.000			0.000
16	0.000	0.000			0.000
17	0.000	0.000			0.000
18	0.000	0.000			0.000
19	0.000	0.000			0.000
20	0.000	0.000			0.000
21	0.000	0.000			0.000
22	0.000	0.000			0.000
23	0.000	0.000			0.000
24	0.000	0.000			0.000
25	0.000	0.000			0.000
26	0.000	0.000			0.000
27	0.000	0.000			0.000
28	0.000	0.000			0.000
29	0.000	0.000			0.000
30	0.000	0.000			0.000
SUM	0.780	0.339	*	*	0.000
AVG	0.026	0.011	*	*	0.000

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@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.
NOTE:

UNIVERSITY OF FLORIDA
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